

An Interim Contract Report for Anya Hindmarch
RCR21-041

Leather Disintegration: ISO 20200 (Modified)
& Additional Compost Testing

Sample ID: TERRA ZEO WITH WAX
20 September 2021



A CONTRACT REPORT

For

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Executive Summary

Anya Hindmarch approached Eurofins | BLC, with regards to evaluating the degradation of their leathers. 1 x leather sample was submitted for analysis:

1. TERRA ZEO WITH WAX

This report contains the results for Sample 1 (S1) – TERRA ZEO WITH WAX.

ISO 20200 (Modified)

The sample was analysed in accordance with BS EN ISO 20200:2015 (modified).

After 45 days thermophilic incubation ($58\pm 2^{\circ}\text{C}$), the following percentage disintegration was measured:

- 100.00% of the sample submitted disintegrated after 45 days thermophilic incubation.


EcoTox

Testing in progress – results to follow

Plant Response Testing

Testing in progress – results to follow

Sample Reference

BLC Reference	Customer Reference	Supporting Image
Sample 1 (S1)	TERRA ZEO WITH WAX	

Methodology

1. BS EN ISO 20200:2015 (Modified)*

Please note that this method is modified. The BS EN ISO 20200:2015 standard is designed to calculate the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test. During this evaluation plastic samples were substituted for leather samples. This may affect the validity of the method (according to the BS EN ISO 20200:2015 standard).

Thermophilic Incubation Period

During the thermophilic incubation period, the test sample was incubated with synthetic compost at $58\pm 2^{\circ}\text{C}$ for 90 days. The changes to the sample/compost mixture that were observed during this period are summarised in Table 2.

Complete disintegration was observed after 45 days in the thermophilic stage and therefore, the disintegration testing was terminated and mesophilic phase was not required.

2. EcoTox Testing*

Eurofins TerrAttesT

3. Plant Response Testing*

WRAP v3.1, Methods for testing plant response to composted material and its contamination by weed seeds and propagules. October 2015. Method code: OFW004-006. Used for assessment of PAS 100 compost standards.

*Please note these tests were performed by an approved subcontract partner laboratory.

Results & Discussion

BS EN ISO 20200 (Modified) Analysis – Post Thermophilic Stage

Table 1: Initial testing parameters and compost composition and evaluation

Test Requirement	Detail		
Test code number:	RCR21-041		
<u>Sample description:</u>	Anya Sample 1 - Terra Zeo and Wax - Brown Red (~2.169 mm) 18 pieces (25 x 25 mm)		
Sample weight (M _i), in triplicate (start):	Mean: 17.920 ± 0.315 g		
Mass of reactor (M _r), in triplicate (start):	539 g		
<u>Test method used:</u>	ISO 20200: 2015 (90 days at 58°C, compulsory; and then 90 days at 25°C, selected)		
<u>Synthetic compost composition</u>	Sawdust	1.68 kg	40%
	Rabbit feed	1.26 kg	30%
	Ripe compost	0.42 kg	10%
	Corn starch	0.42 kg	10%
	Saccharose	0.21 kg	5%
	Corn seed oil	0.17 kg	4%
	Urea	0.04 kg	1%
	Total	4.20 kg	100%
<u>Synthetic compost evaluation (start)</u>	Initial compost carbon: nitrogen ratio (C:N _i): 32:1		
	Initial compost pH value (pH _i): 5.288 (±0.305)		
	Initial compost dry matter value (DM _i): 87.5%		
	Initial compost volatile solids value (VS _i): 96.4%		
<u>Reactor and equipment descriptions:</u>	The reactors used were polypropylene airtight boxes, with removal lids. Box dimensions were 29.5 x 19 x 9.5 mm. The reactor has 2 x 5 mm holes. The incubator is an LTE Scientific IP250-UF. Sieves used were Endecotts Ltd 10, 5, and 2 mm sieves, using the ISO 3310-1:2000 method.		

Table 2: Testing operation, observations, and results (Thermophilic)

Test Requirement	Days from Start	Operation	
<u>Incubation (58°C, 90 days) – observations (for all replicates):</u>	0	Initial mass recorded	
	1,2,3,4,7,9,11,14	Weighed and restored to original mass. Mixed.	
	8,10,16,18,21,23,25,28	Weighed and restored to original mass. No mixing done.	
	30,45	Weighed and restored to 80% of original mass. No mixing done.	
	Day 30-60 (twice a week)	Weighed and restored to 80% of original mass. No mixing done.	
	Day 60 onwards (twice a week)	Weighed and restored to 70% of original mass. No mixing done.	
	7 days	Malty smell (sample absorbed water)	
	14 days	Malty smell (sample difficult to identify)	
	21 days	Musty smell	
	28 days	Malty smell (compost darkening, sample in small soft pieces)	
	35 days	Malty smell	
	42 days	Musty	
	45 days	Sample not visible - Test was ended	
Mass of reactor (M_{rt}), in triplicate (thermophilic end):	Mean: 262 g		
Sample weight (M_{ft}), in triplicate (thermophilic end):	Mean: 0.00 g		
<u>Sample disintegration, D_t, (thermophilic):</u> $D_t = \left(\frac{M_i - M_{ft}}{M_i} \right) \times 100$	100% (0% stays in the 2mm sieve)		
<u>Observations for positive control</u> <i>(these were run alongside the test to check the viability of the test experiments)</i>	Material	Expected disintegration day	Experiment disintegrated
	Dog chew (Raw Hide)	Day 7 - 11	Day 7
	Biodegradable Doggy Bag	Day 28 - 90	Disintegrating
	Sponge Cloth	Day 45 - 90	Disintegrating
<u>Declaration of validity of positive test</u>	The positive test results were as expected so the test was valid.		
<u>Synthetic compost evaluation (end)</u>	Final compost carbon: nitrogen ratio (C:N _{ft}): 30:1		
	Final compost pH value (pH _{ft}): 6.385 (± 0.023)		
	Final compost dry matter (DM _{ft}): 95.6 %		
	Final compost volatile solids (VS _{ft}): 94.9 %		
<u>Synthetic compost's decrease in volatile solids (R_t), after thermophilic:</u> $R_t = \left(\frac{(M_{rt} \times DM_t \% \times VS_t \%) - (M_{rft} \times DM_{ft} \% \times VS_{ft} \%)}{(M_{rt} \times DM_t \% \times VS_t \%)} \right) \times 100$	47.72 ± 0.85 %		

Equation Definitions:

M_i – Initial dry mass of the test material

M_{ft} – Final sample mass (at the end of the thermophilic stage)

M_{ri} – Initial mass of the wet synthetic waste introduced into the reactor

DM_i – Initial dry mass of the synthetic waste, expressed as a percentage divided by 100

VS_i – Initial volatile-solids content of the synthetic waste, expressed as a percentage divided by 100

M_{rft} – Final reactor mass – thermophilic

DM_{ft} – Final dry mass of the compost, expressed as a percentage divided by 100 – thermophilic

VS_{ft} – Final volatile-solids content of the compost, expressed as a percentage divided by 100 – thermophilic

The test was deemed **viable** (see the requirements below):

Test Requirement	Measured				Expected Standard
Volatile solids change	47.72 %				>30%
pH	Start:	5.288	End:	6.385	5-9
C:N ratio	Start:	32:1	End:	30:1	20:1-40:1 (at start)
Observations	The progression of the composting appeared as normal.				See ISO 20200 for definition of normal composting progression.

The average disintegration for the test sample was **100%** (measured as change in mass) after the thermophilic stage. There is no leather industry specification as such that defines the desirable degree of disintegration.

The plastic industry specification (BS EN 14995:2006¹) that informs the requirements of EU Directive 94/62/EC, states that in terms of disintegration, a material is said to be disintegrated, in compost, if no more than 10% of the starting material is retained by a 2 mm sieve, after the thermophilic incubation period (for ISO 16929: 2019²).

0% of the test sample was retained by a 2 mm sieve after the thermophilic stage of the laboratory-scale ISO 20200 (modified) test. Therefore, if this substrate were applicable and tested against BS EN 14995:2006 requirements, this substrate (in its current state), could be a promising candidate for the disintegration element of the compostability requirements.

¹ BS EN 14995:2006 Plastics. Evaluation of compostability. Test scheme and specifications

² ISO 16929:2019 Plastics - Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test

Post ISO 20200 (Modified) Compost Analysis – EcoTox Analysis

Testing in progress – results to follow

Post ISO 20200 (Modified) Compost Analysis - Plant Response Testing

Testing in progress – results to follow

Appendix 1 – ISO 20200 (Modified) Supporting Images (Start)

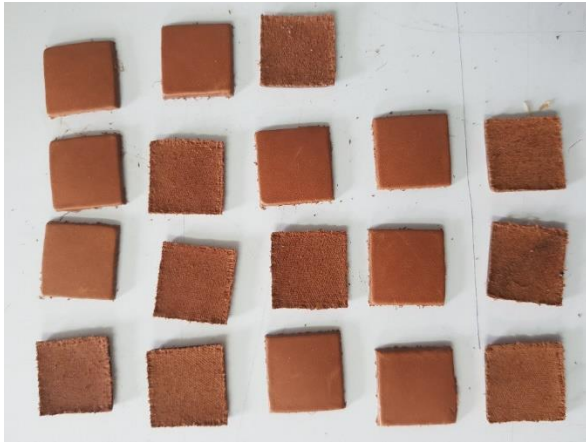


Figure 1: Leather before starting the thermophilic stage.



Figure 2: Leather pieces in the reactor at the start of the process.

Appendix 2 - ISO 20200 (Modified) Supporting Images (Middle)



Figure 3: Leather had gone soft by Day 4



Figure 4: Leather Appearance - Day 9



Figure 5: Leather Appearance - Day 14



Figure 6: Leather Appearance - Day 30

Appendix 3 - ISO 20200 (Modified) Supporting Images (End)



Figure 7: Compost at the end of the test - Day 45